

FURTHER OBSERVATIONS ON THE DISTRIBUTION OF MANGROVES IN THE EASTERN CAPE PROVINCE.

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ABSTRACT

The distribution of mangroves between the Bashee River and East London was investigated. Mangroves were found along the Bashee, Nqabara, Nxaxo, Kobonqaba and Gonubie Rivers. *Avicennia marina* was present at all these localities, while *Bruguiera gymnorhiza* occurred only at the Bashee and Nxaxo Rivers.

UITTREKSEL

VERDER OPMERKINGS OOR DIE VERSPREIDING VAN WORTELBOOME IN
DIE OOS-KAAP PROVINSIE.

Die verspreiding van wortelbome tussen die Basheerivier en Oos-Londen is ondersoek. Wortelbome het slegs langs die Bashee-, Nqabara-, Nxaxo-, Kobonqaba- en Gonubieriviere voorgekom. *Avicennia marina* is op al hierdie plekke aangetref, terwyl *Bruguiera gymnorhiza* slegs by die Bashee- en Nxaxoriviere gevind is.

INTRODUCTION

Several workers have pointed to the decreasing occurrence and importance of mangroves along the eastern Cape coast. This community was described as well-developed at the Bashee River and as reaching its southern limit near East London (Muir, 1937; West, 1944; Macnae & Kalk, 1962). However, no detailed information was available on the distribution of mangroves in the area between these points. From time to time the writer received vague reports of mangroves along certain rivers in this area.

An intensive survey of the rivers in the districts of Willowvale, Kentani, Komga, and East London was undertaken to provide a more complete picture of the distribution of mangroves. With the exception of the Mendu River, all the larger rivers in the area between East London and the Bashee River were examined (Fig. 1). In most cases the rivers were examined on foot for a distance of approximately 3 km upstream from the mouth. Where it was not possible to examine both banks along the entire length, the opposite bank was scanned carefully through 10 × 50 binoculars. Although for several years previously the writer has conducted sporadic surveys of some of the rivers in this area, intensive surveys were conducted in January, July and December.

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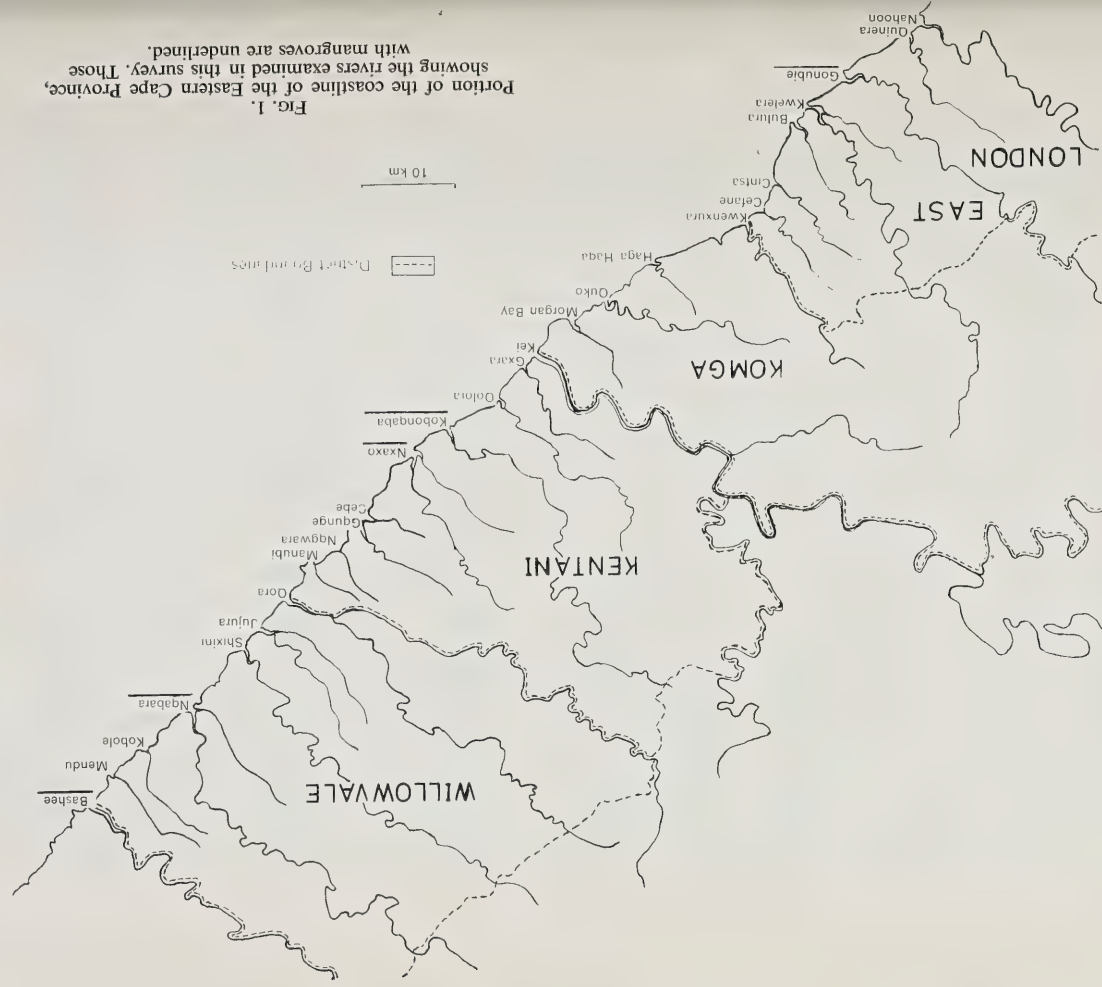


Fig. 1.
Portion of the coastline of the Eastern Cape Province,
showing the rivers examined in this survey. Those
with mangroves are underlined.

1969, and January, 1970. Most rivers south of the Kei River and in the southern part of the Willowvale district were visited twice during this period.

The objects of this survey were mainly to establish the presence or absence of mangroves along these rivers, the approximate extent and species composition of the stands, and the condition and regeneration of the mangroves. This survey has indicated the local importance of mangroves along certain rivers in the southern Transkei and their almost complete absence south of the Kei River.

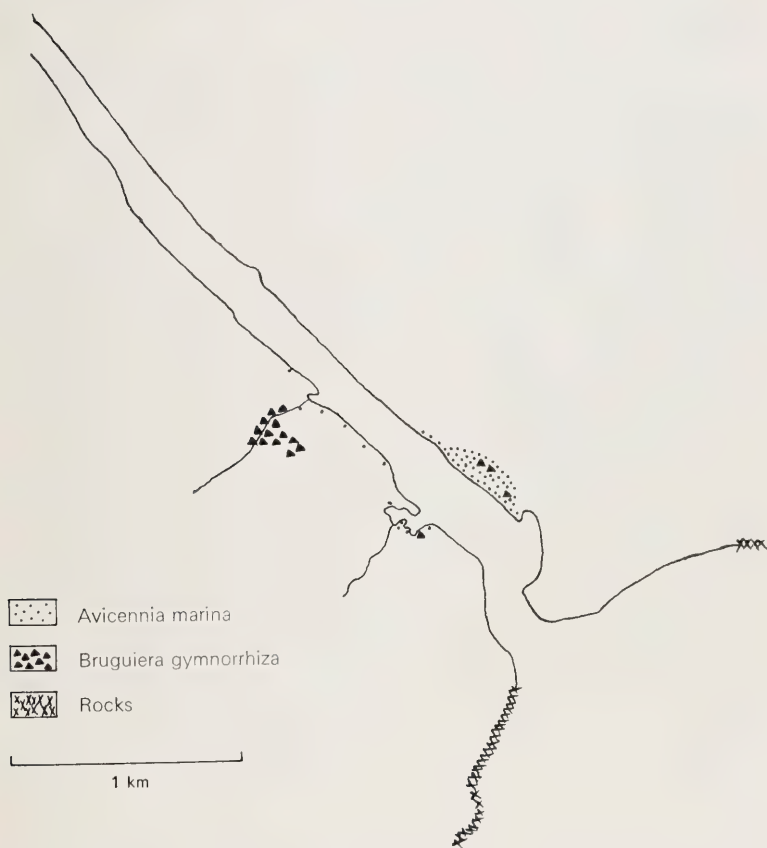


FIG. 2.
Distribution of mangroves along the Bashee River.

DISTRIBUTION OF MANGROVES

Mangroves were found only along the Bashee, Nqabara, Nxaxo, Kobonqaba, and Gonubie Rivers. The distribution of mangroves along these rivers is shown in Figs. 2—6.

This river, which formed the northern limit of the survey, was visited on 23/1/70. With the exception of a slight curve at the mouth, the river is straight for a distance of 3.5 km upstream. Both banks are fairly flat and extensive mudflats are present near the mouth. Among local inhabitants the river is noted for its frequently muddy colour which suggests that silt deposition must be significant at the mouth.

Although he did not visit them, West (1944) reported the presence of a large stand of *Bruguiera gymnorhiza* on the southern bank. This stand was, in January 1970, not so extensive and the surviving trees were in poor condition. The presence of stumps indicated that a large number of trees had died in that part of the stand nearest the river. It was obvious that even trees of moderately large size had not escaped; relicts of trees of 6—7 m in height were seen. The reasons for this mass mortality were not evident, although it is suggested that heavy depositions of silt and consequent covering of the base of the trees were a factor. It did appear as if the level of the bank had been raised. This is probably also the reason for the unhealthy appearance of the remaining trees, the tallest of which were only 4 m. Apparently the river seldom, if ever, reaches these trees nowadays. This was borne out by the ground vegetation which consisted chiefly of *Stenotaphrum secundatum*, *Juncus kraussii*, *Cynodon dactylon* and *Phragmites australis*.

On mudflats nearer the river scattered trees and saplings of *B. gymnorhiza* and *Avicennia marina* occurred among ground vegetation consisting chiefly of *Arthrocnemum* spp. and *Sporobolus virginicus*.

The main stand of mangroves was on the north bank. The mangrove community stretched along this bank for a distance of 400 m and was approximately 100 m wide. The trees consisted almost entirely of *A. marina*, the tallest of which were 8 m in height. Clear differences in age could be distinguished among members of this community. The older members were clearly seen from their size and their branching near the base. Apparently they colonized this area 14—20 years ago. The younger trees, which formed a dense growth among the scattered older trees, were upright with no branching low down. The community was well established and had obviously withstood flooding successfully.

Only six saplings of *B. gymnorhiza* were found scattered among the *A. marina* and, although the tallest was not much more than 3 m in height, they appeared healthy. The larger specimens were flowering.

The ground vegetation consisted mainly of *Arthrocnemum* spp. although *Cotula coronopifolia* and *Triglochin striata* were also common.

Landwards the mangroves gave way to a mixed community of *S. secundatum* and *J. kraussii*. This in turn was succeeded by dune bush with *Hibiscus tiliaceus* along the margin. Upstream the mangrove community passed into the mixed *Stenotaphrum*—*Juncus* community which occurred in a belt along the bank of the river for several hundred metres.



FIG. 3.
Distribution of mangroves along the Nqabara-Nqabarana Rivers.

A few hundred metres from its mouth the Nqabara River is joined by the Nqabarana River. A spit of sand restricted the width of the mouth to approximately 20 m. Apparently poor rainfall during the past few years had resulted in the accumulation of sand at the mouth, causing it to become narrower and shallower.

The Nqabara is a wide river which winds gently on its last 5 km to the sea. For approximately 2.5 km from the mouth the north bank rises steeply from the water and is covered with bush broken only where a stream enters the river. On the south bank also the ground rises steeply for a distance of 1.5 km. Thereafter except for a short krantz 4 km upstream on the north bank the banks are fairly flat for a few kilometres.

Along this river *A. marina* occurred on the mudflats on both banks. The stand furthest from the mouth occurred on the south bank approximately 4.5 km upstream, although isolated plants were seen further upriver. While the trees extended further up the river from the mouth on this south bank, they were confined to a narrower belt than on the north bank. On the latter bank the first well-developed community occurred at A (Fig. 3) where the stand was about 25 m wide. This tapered to a belt 10 m in width and finally to only a single row of trees lining the bank. The tallest trees were 8 m in height, but towards the end of their distribution they were much shorter (3–4 m).

In addition to the continuous stand, small pockets of trees occurred in patches on mudflats below the krantzes wherever a stream entered the river. Isolated trees also occurred along the base of the krantzes where there were small deposits of mud between rocky outcrops. Although no measurements were possible, it was obvious from their height that they had been growing there successfully for some years.

Flowering was evident on mature trees. Extensive colonization was taking place on both banks at A and on the south bank at B (Fig. 3). The colonization on the south bank at A is interesting because a line of saplings has extended into the river at an angle to the mangroves lining the bank (Fig 4). At low tide these saplings were seen to be growing on the edge of a silt bank which had developed outwards from the main bank.

The ground vegetation along the river banks consisted almost entirely of *Arthrocnemum* spp. In the flatter areas alongside the river maize lands extended almost to the edge of the mangroves.

There seemed to be comparatively few mangroves intermediate in size between those of the newly established patches and the mature trees. Apparently in the past the young plants were killed in some way, leaving only the more mature specimens.

The Nqabarana River is narrower and more winding than the Nqabara. Due to near gale-force winds and rough water on 13/1/70 when this area was



FIG. 4.

Avicennia marina lining Nqabara River with recently-established saplings on alluvial spit at A. View looking towards mouth.

visited, it was not possible to study the distribution of mangroves for any great distance along the Nqabarana River. The distribution recorded on the map for this area (Fig. 3) is based on rough observation on the writer's part and on information obtained from a colleague. The responsibility for any inaccuracies, should they occur, is entirely the author's.

At its junction with the main stream, the Nqabarana River had a small, well developed stand of *A. marina* on the north bank, but this ended where the bank becomes steep. Further along this bank there was a small patch at the confluence of a small stream, otherwise there were no further mangroves until the steep bank is replaced by mudflats. The south bank is fairly flat and supported a continuous narrow belt of *A. marina*.

A common mouth serves these two rivers which were visited on 24/1/70. The mouth is very narrow, only a few metres wide in places, although this closure has been aggravated by droughts in recent years.

At the confluence of the rivers there is a large flat area where the best development of mangroves occurred. In this area the stand was about 100

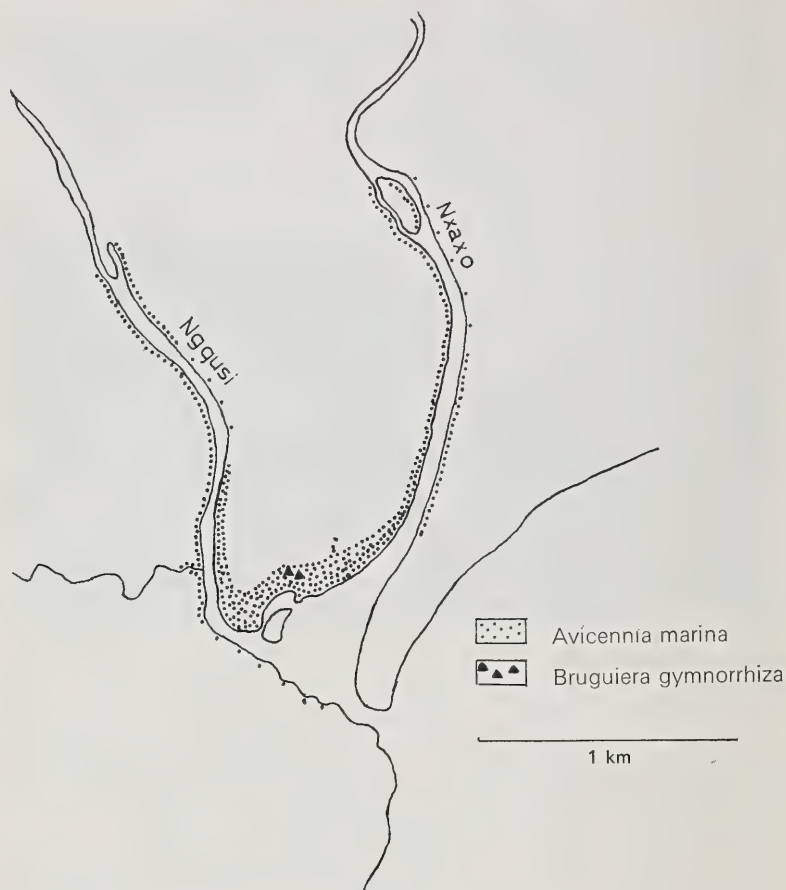


FIG. 5.
Distribution of mangroves along the Nxaxo-Nqusi Rivers.

metres wide and consisted mainly of *A. marina*. These varied in size from plantlings to trees 7 m in height. The community appeared healthy and flowering was evident on the more mature specimens. The proprietor of the local boarding-house confirmed that there had been an increase in the stand during the past ten years. A few young trees of *B. gymnorhiza* also occurred, but they were generally scattered except for one small community towards the inland edge

of the stand. The tallest tree was 4 m in height and had well-developed knee roots. Developing fruits were present on the bigger specimens.

From this confluence the stand tapered to a narrow belt along the rivers. *A. marina* was the only mangrove lining the rivers' banks.

The distribution along the Nxaxo River was mainly along the south bank. Here the stand narrowed gradually to a belt which was 20 m in width for most of its length and finally gave way to isolated trees. As the stand narrowed the trees became shorter and at the extremity they were only 1–2 m in height. Among the mangroves the ground vegetation consisted almost entirely of *Arthrocnemum* spp. On the landward edge of the community the vegetation was variable due to disturbance for the cultivation of maize, but generally there was a narrow belt of *Phragmites australis*, *Juncus kraussii*, and *Stenotaphrum secundatum* between the mangroves and the lands. Along the north bank there was one short belt of trees with only isolated scrubby specimens further upstream.

Along the Nqusi River the mangroves occurred as a narrow continuous belt on the south bank, but were generally scattered along the north bank. At the extreme end of their distribution the belt had narrowed to only a single line of trees which were scrubby (1–2 m in height).

There were few big trees in evidence in this area. This is believed to be due to the extensive chopping of larger trees by local Africans for use mainly in the construction of kraals. There was frequent evidence of chopping having been carried out in the recent past. Obviously *A. marina* in this area can grow fairly large if left undisturbed. In an inaccessible part along the Nqusi River a tree of height 8–10 m was observed whose stem diameter measured 48 cm at a height 1 m from the ground (below the branching main stem).

This appears to be the southernmost river on which an extensive stand of mangroves occurs in South Africa. The Kobonqaba River is the largest of the rivers within the Kentani district, and although the mouth has in recent years become narrower and shallower, it has never closed. *A. marina* was the only mangrove observed.

The main distribution was along the south bank. The tallest trees were 7 m in height. Near the mouth only occasional trees were found, but from about 1 km upstream there was a continuous belt, at first fairly wide although narrowing towards the extremity. Here the stand was only 10 m wide and the plants scrubby. On both banks of a small tributary there was a well developed stand. The community appeared to be healthy and regeneration was evident. The ground vegetation consisted almost entirely of *Arthrocnemum* spp.

Along the north bank mangroves occurred in only two patches. The larger of these occurred as a fringe along the river and measured 20 m at its widest point. The tallest tree was 7 m in height although the stumps of specimens



FIG. 6.
Distribution of mangroves along the Kobonqaba River.

which could have been even taller were found. One stump measured 26 cm in diameter, at a height of 0.66 m from ground level. Flowers were present on the older trees. Active regeneration was obvious from the presence of young trees. Again *Arthrocnemum* spp. formed the only ground vegetation. The other patch along this bank was not examined carefully, but it occurred apparently where a rivulet joined the main stream.

Along this river chopping had clearly been carried out fairly extensively.

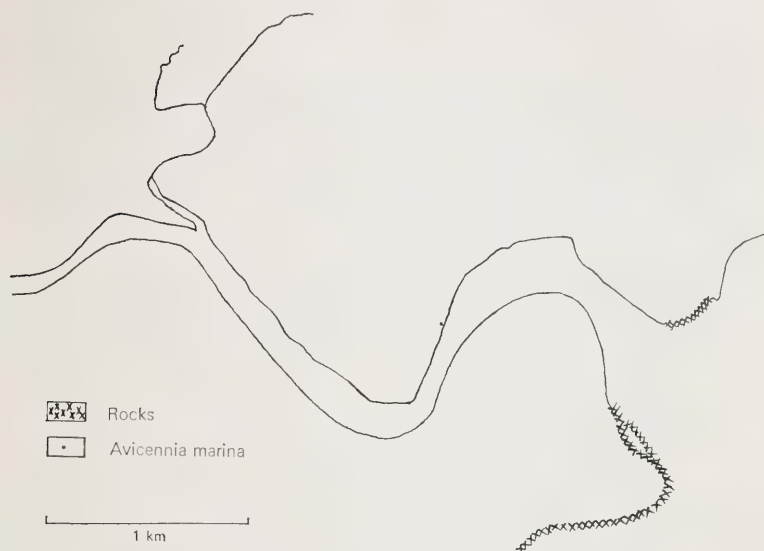


FIG. 7.
Distribution of mangrove along the Gonubie River.

South of the Transkei this was the only river along which any mangrove was found. The Gonubie River is one of the larger rivers in the East London district and reaches the sea in a series of gentle curves near the mouth. There is a rocky projection into the sea just south of the mouth which is fairly wide and has never been known to close. The south bank of the river is steep and rocky for approximately 2,5 km upstream. The opposite bank is dominated by a krantz which gives way to mudflats almost 1 km from the mouth.

On 19/12/69 these mudflats were visited and at about high-water mark a single specimen of *A. marina* was found growing among *Arthrocnemum* sp. The plant was branched low down and just over 1 m in height. The furthest pneumatophore was at a distance of 50 cm from the main stem. Although there was no sign of flowering, the plant looked healthy.

DISCUSSION

The results from the survey area have confirmed that mangroves are of negligible importance south of the Kei River, while north of this mangroves are absent from only two of the larger rivers (i.e. Shixini, Qora) which are open permanently. Information collected further north between the Bashee

and Umzimvubu Rivers suggests that mangroves are more numerous than one might expect.

In the S.E. Cape Province there are many smaller rivers which are open to the sea but only irregularly so or for relatively short periods. Most of the rivers in this area appear to fall into this category. Although these were included in the survey, no mangroves were found. Along many of these rivers there are fairly extensive mudflats which would seem to provide suitable conditions for the establishment and growth of mangroves. Their absence can probably be ascribed largely to the following factors:

- (a) These rivers are open for relatively short periods which may not coincide with the time of arrival of propagules.
- (b) When the mouth does open, there appears to be a net outflow of water, and this increases the odds against any propagules entering the river while it is open to the sea.
- (c) With this net outflow the level of the river falls until the mouth becomes closed once more. Over the succeeding months, seasons, or even years, the level gradually rises again as a result of rains or inflow from tributaries, until the river is high enough to flow into the sea again. Propagules entering the river would do so at its low level and any seedlings which may become established would probably be drowned as a result of continuous submersion under the rising waters of the river.
- (d) When these rivers do open to the sea the mouth is usually very narrow, which must limit the chances that propagules will be able to enter the river.
- (e) The number of propagules reaching the more southerly parts of the survey area is undoubtedly low.

On the other hand, there are several rivers which remain open permanently, which have fairly extensive mudflats, and yet have no mangroves. Examples are the Shixini, Kei, Kwelera, and Nahoon Rivers. Although there was a report of *Bruguiera gymnorhiza* along the Kei River (Muir, 1937), no mangroves were found after an exhaustive search along both banks for a distance of almost 4 km upstream. On both banks there are mudflats, although they are more extensive on the north bank. Here the vegetation comprises mainly *Arthrocnemum* spp., *Sporobolus virginicus*, and *Triglochin striata*.

Along the north bank the Kwelera River has a wide, long mudflat which extends for approximately 2 km upstream. *Arthrocnemum* spp. and *Limonium scabrum* are the main constituents. The relatively narrow mouth of this river probably limits the chances of mangroves being established here. Although conditions along the Qora River are not really suitable for the establishment of mangroves, those along the Shixini River are, and the presence to the north

of several rivers supporting well-developed stands of *A. marina* (viz. Nqabara, Bashee, Xora) makes its absence more surprising.

The reasons for the almost complete absence of mangroves in the Ciskei are also not clear. In Australia and New Zealand mangroves (*A. marina*) are found at a lower latitude and under cooler conditions than in South Africa. Furthermore, there is a good development along the Nxaxo and Kobonqaba Rivers where climatic conditions are unlikely to be significantly different from those near East London. This suggests that temperatures of the order experienced in the S.E. Cape are not of prime importance in limiting distribution. During December, 1969, the writer transplanted six *A. marina* seedlings from Durban Bay on a mudflat on the north bank of the Nahoon River. The object was to measure their growth subsequently at regular intervals and to compare these results with similar measurements in Natal and in growth cabinets. The seedlings were approximately 20 cm tall at the time of planting. In December, 1970, the area was revisited and not only had two survived the worst recorded floods in East London's history, but also their growth in that year had been significant. The larger tree had reached a height of 30 cm and appeared healthy. In this area a seedling from a previous transplanting had survived a silt deposition of approximately 15 cm from these floods. These preliminary results and the condition of the sapling at Gonubie indicate that growth of *A. marina* is fairly good near East London and support the contention that unfavourable climatic conditions cannot be regarded as the main factor responsible for its absence in this region. It is suggested that the reasons for the absence of mangroves must also lie in the paucity of propagules and possibly unfavourable ocean currents (Macnae, 1962).

Several reports were received of the occurrence of mangroves along some of the other rivers in this area, the southernmost "find" being apparently *B. gymnorhiza* at Mcantsi River, near Kidd's Beach. All these reports were investigated, but no further mangroves were seen. In fact, it is extremely unlikely that mangroves could ever have occurred at some of these places.

There is no evidence that mangroves in recent times were more widespread in this area than they are now. It is possible that along some of the rivers an occasional seedling might have become established only to be destroyed soon afterwards. The absence of trees in other estuaries supports this view. Had any tree grown to maturity there would probably be some evidence of its existence now. The occurrence of several seasons of low rainfall before the survey would have favoured the establishment of seedlings. Prior to the survey, heavy rains were experienced in this area during autumn, 1963, and it is thus unlikely that any seedlings which reached these parts subsequently would have failed to have established themselves due to flooding. The recent experience at Nahoon sug-

gests that even the 1963 rains would probably not have affected young trees or seedlings.

However, observations during the next few years may reveal a more widespread distribution to be taking place. Reports of rivers with mangroves have indicated their increase during the past 10—15 years. Many of these trees will have already reached or will soon reach a reproductive stage. If this increased production of propagules occurs at a time when river mouths have been opened up by good rains, then a spread of mangroves to previously uncolonized areas could well result. Reference has already been made to the community along the Nqabara River where only old and young trees appear to be present. This suggests that in some way destruction of the younger members of the community occurred in the past. If this is a phenomenon which occurs periodically, then the same fate may befall the present developing communities in this area, with a consequent reduction in production of propagules and no further increase in distribution. If, however, this can be shown over the next few years to be not so, then in fact we may be observing a part of our vegetation still in the process of its southward migration.

Reference has already been made to the extensive chopping of larger trees along some rivers in the Transkei. Obviously some effective measure of control must be exercised if these important southernmost communities are to survive in a healthy condition.

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